

**GENERALLY ACCEPTED
AGRICULTURAL AND MANAGEMENT
PRACTICES FOR
THE CARE OF FARM ANIMALS**

**Adopted By
Michigan Commission of Agriculture
Lansing, Michigan**

JUNE 2002

In the event of an agricultural pollution emergency such as a chemical/fertilizer spill, manure lagoon breach, etc., the Michigan Department of Agriculture and/or the Michigan Department of Environmental Quality should be contacted at the following emergency telephone numbers:

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If there is not an emergency, but you have questions on the Michigan Right To Farm Act or items concerning a farm operation, please contact the:

Michigan Department of Agriculture
Right to Farm Program
P.O. Box 30017
Lansing, Michigan 48909
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GENERALLY ACCEPTED AGRICULTURAL AND MANAGEMENT PRACTICES FOR THE CARE OF FARM ANIMALS

OVERVIEW

These voluntary Generally Accepted Agricultural and Management Practices (Practices) are intended to be used by the livestock industry and other groups concerned with animal welfare as an educational tool in the promotion of animal husbandry and care practices. The recommendations do not claim to be comprehensive for all circumstances but attempt to define high standards for livestock production and well-being in commercial and farm operations. These Practices can serve producers in the various sectors of the livestock industry to compare or improve their own managerial routines. It should be understood that new scientific discoveries and changing economic conditions may make necessary revision of the Practices.

Proper animal management is essential to the well being of animals and the financial success of livestock operations. A sound animal husbandry program provides a system of care that permits the animals to grow, mature, reproduce and maintain health. Specific operating procedures depend on many objective and subjective factors unique to individual farm operations.

Animal well-being is a function of many environmental variables, including physical surroundings, nutrient intake and social and biological interactions. Environmental conditions should minimize disease, death loss and behavioral problems and enhance performance. Particular components of the environment that should be managed include housing, space concentrations, pests, nutritional factors and water. Domestic animals readily adapt to a wide range of environments.

Sometimes procedures that result in temporary stress and even some pain are necessary to sustain the long-term welfare of the animals. Some of these procedures reduce aggressive behavior and injuries among animals. These practices have developed over generations of animal care and husbandry and include but are not limited to; beak-trimming, dehorning, tail docking and castration of males. Various humane techniques are available, but at present, no technique can be recommended as ideal under all circumstances for any species.

The livestock industry is involved in many activities that require the movement of animals. The handling of livestock in shows, exhibitions, fairs, and races should always be done with primary concern for handler, public, and animal safety. Animals need to be humanely trained, shown, and exhibited using safe and non-harmful devices and procedures.

Transportation by road, boat, rail and air requires careful planning to reduce adverse effects on animals. Any preconditioning of the animals to the conditions they will face will ease their stress during transportation. Vehicles should be of adequate size and strength for the animals carried. Floors in particular, should be in good repair and sufficiently solid to prevent animals from breaking through. The inside walls and lining should have no sharp edges or protrusions likely to cause injury. Vehicles should be constructed of materials that are easily cleaned and kept as clean as possible. Enclosed vehicles must have adequate ventilation, especially when stationary.

A complete manure management plan is suggested when caring for farm animals. The goals of this plan should be to:

- ! maintain acceptable levels of animal health and production through clean facilities;
- ! prevent pollution of water, soil, and air;
- ! minimize generation of odors and dust;
- ! minimize vermin and parasites;
- ! comply with local, state, and federal laws, regulations, and policies.

A farm or farm operation that conforms to these and other applicable GAAMPs adopted under the Michigan Right to Farm Act according to the Michigan Right to Farm Law (Act 93 of 1981, as amended), shall not be found to be a public or private nuisance. This protection also covers farm operations that existed before a change in the land use or occupancy of land within one mile of the boundaries of the farmland, if before that change, the farm would not have been a nuisance. Likewise, this conditional protection applies to any of the following circumstances (P.A. 93 Section 3 (3)):

- (a) A change in ownership or size.
- (b) Temporary cessation or interruption of farming.
- (c) Enrollment in governmental programs.
- (d) Adoption of new technology.
- (e) A change in type of farm product being produced.

Domestication of livestock has made farm animals dependent on humans. Consequently, humans have accepted this dependence as a commitment to practice humane conduct towards domestic animals and to prevent avoidable suffering at all stages of their lives. These voluntary Practices represent a step toward meeting that commitment. The Practices include care for the major farm animals raised in Michigan.

GENERALLY ACCEPTED AGRICULTURAL AND MANAGEMENT PRACTICES FOR

BEEF CATTLE, BISON AND LLAMA

MANAGEMENT OVERVIEW

Because of similarities among production practices between beef cattle, bison and llamas, Generally Accepted Agricultural and Management Practices (Practices) for care of these animals will be similar in many cases. Genetic variation among cattle species, breeds and individuals makes it possible for them to thrive in a wide range of natural conditions and artificial environments. When behavioral and physiological characteristics of cattle are matched to local conditions, beef cattle thrive in virtually any natural environment in Michigan without artificial shelter. Protection, however, may be beneficial, especially for newborns, during adverse weather conditions. Cattle reside on pastures and woodlots, in small drylot facilities, in a variety of different types of feedlots, and in confinement.

MANAGEMENT PRACTICES

Nutrition: Feed and water should be presented to cattle in ways that minimize contamination by urine, feces, and other materials. Feedbunks, where used, should be monitored and kept clean. Animals should be fed and watered in a manner consistent with one of the following publications: Nutrient Requirements of Beef Cattle (National Research Council, 1984 or 1996), Animal Breeding and Production of American Camelids (Escobar, 1984) and Buffalo Management and Marketing (1983).

Cattle may vary considerably in body weight during the course of grazing and reproductive cycles. Feeding programs should make it possible for animals to regain the body weight lost during the normal periods of negative energy balance. Cattle, bison and llamas should have frequent access to a source of water. When continuous access to water is not possible, water should be available for 30 minutes at least twice daily, or more frequently depending on weather conditions, amount of feed consumed, and level of production of the animals.

Manure Management and Sanitation: Manure management should conform to the recommendations presented in the Right to Farm Practices. Midwest Plan Service (1987a) has a publication on recommended waste handling facilities. For the pasture based systems, manure management and sanitation are less of a concern but care should be taken to protect surface waters and prevent erosion.

Animal Handling and Restraint: Some aggressive behaviors of larger farm animals risk the health and well-being of herd mates as well as the humans handling these animals. Such behaviors may be modified and their impact reduced by a number of acceptable restraint devices (e.g., hobbles, squeeze chutes, and stanchions) and practices. Restraint should be the minimum necessary to control the animal and still ensure the safety of attendants. Proper design of the handling facility will facilitate animal movement (Midwest Plan Service, 1987b). Roping of cattle is necessary under certain conditions (e.g., in pastures when an animal needs treatment and no restraining facility is readily available).

Bison are less domesticated than cattle and require special handling facilities. Specific practices can be obtained from the National Buffalo Association (Jennings and Hebring, 1983).

Transportation: Safety and comfort should be the primary concerns in the transportation of any animal. Weak and unhealthy animals should be separated from healthy animals during transport. When animals are transported, they should be provided with proper ventilation and a floor surface that minimizes slipping. Animal injuries, bruises, and carcass damage can result from improper handling of animals during transport. Recommendations on facility design for loading and unloading trucks and restraint of animals have been published (Grandin, 1980, 1983 a,b). Transport and handling stresses can be aggravated greatly by adverse weather conditions, especially when the weather is changing rapidly.

RECOMMENDATIONS FOR THE ENVIRONMENT

Cattle on pasture and woodlots are often monitored less directly and less frequently than cattle raised in other systems. Cattle in woodlot and pasture systems are more likely to be affected by weather, predators, insects, internal and external parasites, poisonous plants, and variation in feed supply. Hot or extremely cold weather is stressful and special accommodations may be needed (National Research Council, 1981). In extreme heat, cattle will be more comfortable with provision of shade. Likewise, cattle exposed to extreme cold and wind chill should be provided extra feed and shelter from the wind. A properly maintained perimeter fence is recommended for the safety of the animals and surrounding community.

FACILITIES AND EQUIPMENT

Beef cattle may be housed in intensive management systems, either indoors or in open lots, with or without overhead shelter. Proper airflow and ventilation are essential in confinement facilities. A windbreak in mounded south-sloping feedlots is recommended so that dry areas with low air velocities are available on which the cattle can rest.

For additional information, see the Structures and Environment Handbook (Midwest Plan Service, 1987a) and the Beef Housing and Equipment Handbook (Midwest Plan Service, 1987b).

HEALTH CARE AND MEDICAL PROCEDURES

Adequate health care is an essential part of a profitable beef cattle operation. A health care program should be planned to address potential problems as appropriate for local conditions. Appropriate health care involves 1) methods to prevent, control, diagnose, and treat diseases and injuries; 2) training and guidance to animal caretakers on appropriate antibiotic therapy; 3) instruction on proper handling of pharmaceuticals and biologicals and withdrawal times and 4) adequate record keeping systems. All confined animals should be observed daily for signs of illness, injury, or unusual behavior.

Methods of prophylaxis, diagnosis, therapy, and disease control should follow currently accepted practices. Assistance from a veterinarian in establishment of a health care program is recommended.

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GENERALLY ACCEPTED AGRICULTURAL AND MANAGEMENT PRACTICES FOR SWINE¹

MANAGEMENT OVERVIEW

In Michigan, swine can be raised humanely in a variety of production systems, provided they are given ample protection from extreme cold, excessive wind, solar radiation, and precipitation. Production systems used include (1) environmentally controlled buildings in which the pigs remain inside, (2) open-front buildings that permit the pigs to go outside, and (3) outside lot or pasture production with portable shelters. Good quality facilities and sound management skills optimize animal comfort and well-being regardless of the type of production system.

MANAGEMENT PRACTICES AND TRANSPORTATION

Observation: Pigs should be observed routinely and more frequently during farrowing, postsurgical recovery, or recovery from illness. During observations, waterers and feeders should be checked to make sure pigs have access to both feed and water. Pigs should be examined for signs of health problems, physical discomfort, or injuries. Facilities need to be inspected to be sure they are functioning properly. Producers need to be aware of these responsibilities during normal work hours, nights, and weekends.

Identification and Records: Pigs generally have some form of identification that can be easily read. These identification methods may include ear notches, ear tattoos, electronic transponders, ear tags, or pen recognition. Identification is important to maintain records and track pigs as they are moved through the various production phases. Many different types of management records may be kept depending on the type of production system (medical, production, genetic selection programs, nutritional, and facility).

Baby pig care: After birth, any of the following procedures may be performed on piglets by a skilled individual to help reduce the risk of disease and infections: (1) disinfection of navel, (2) clipping of needle teeth, (3) supplementing iron by injection or orally, (4) docking of tail, (5) identifying permanently, and (6) castrating males.

Nutrition: Swine are raised on a variety of feeds. Feedstuffs should be free from harmful molds, mycotoxins, or impurities; of the presence of any of these substances or organisms are suspected, samples should be submitted for laboratory testing. Feed with unrecognized nutritional value and lacking in wholesomeness should not be used.

¹Condensed from Swine Care Handbook, National Pork Producers Council, 1999.

The diet should meet the nutritional needs of the pigs and fit the purpose for which it is being fed (i.e., growth, reproduction, or lactation). Nutrient requirements, including that for water, are described in the NRC publication, *Nutrient Requirements of Swine*.

High intake of rations may cause excessive weight gain during gestation. Boars and sows allowed access to free-choice feed will become obese. Restriction of energy intake is suggested for boars and gestating females. This may be done by decreasing daily feed intake, adding fiber to the diet, or feeding every one to three days. Pigs in other phases of production are generally given free choice access to feed.

Manure Management and Sanitation: Manure handling and utilization systems for swine facilities should conform with practices adopted by the Michigan Agriculture Commission in its document entitled *Generally Accepted Agricultural and Management Practices for Manure Management and Utilization*.

Pigs should be kept comfortable and healthy. Defecating and resting preferences should be considered during the design phase as well as during the day-to-day operation of swine facilities. The frequency of manure removal from swine facilities is dependent on several factors including: pen size, animal density, temporary manure storage capacity and flooring type. Building interiors, corridors, storage space, and other work and production areas should be kept clean.

Animal Handling and Restraint: An understanding of the behavioral characteristics of pigs will aid in handling, increase productivity, improve meat quality, and help reduce undesirable stress. At all stages, pigs should be handled with care, gentleness and patience. Pigs have wide angle vision in excess of 300 degrees. Although this allows them to see behind themselves without turning their heads, it also causes them to be sensitive to sharp contrasts in light and dark. Pigs may balk if they encounter shadows, puddles, bright spots, a change in flooring type or texture, drains, metal grates, or flapping objects.

Lights inside a building or inside a truck will attract pigs because they have a tendency to move from a darker area to a more brightly lit area. Funnel-shaped pens should not be used to load pigs because pigs have a tendency to continue to press forward. There should be an abrupt entrance to the chute. Loading ramps with solid fences are more efficient than "see through" fences because they decrease distractions.

Pigs will stop when a solid barrier is placed in front of them. Small portable panels will allow efficient moving and sorting. A light aluminum, plastic or wood panel with a hinge in the middle is useful in separating pigs from a pen.

For examination, collection of samples, and other clinical manipulations, pigs can be restrained manually or with handling aids such as snout snares, restraint stocks, or

stalls. It is important that these devices be the right size and designed for the pig being held and that they be operated properly to minimize stress and to avoid pain and injury.

Transportation: Injuries and bruises can result in carcass damage when pigs are improperly managed during handling and transport. Recommendations of facility design for loading and unloading trucks, restraining animals, and handling them in packing plants have been published (Grandin, 1983, 1988, 1991).

Weak pigs should not be loaded or transported with healthy ones. Appropriate steps should be taken immediately to segregate sick pigs and care for their special needs.

When pigs are transported, ventilation should be adequate and the floor should be slip-resistant. When possible, animals should be shipped in groups of uniform weight and provided with adequate space. (Grandin, 1988; Grandin et al., 1989).

Transport and handling stresses can be aggravated by adverse weather and wide temperature fluctuations. Hot weather is a time for particular caution. While in transit in warm weather, pigs should be protected from heat stress by being shaded, wetted, and bedded with wet sand or shavings. Prompt unloading in hot weather is essential because heat builds up rapidly in a stationary vehicle.

During transportation in cold weather, pigs should be protected from cold stress. Wind protection should be provided when the air temperature drops below 32°F, but ventilation must always be adequate. When trucks are in transit in cold weather for more than a few minutes, pigs should be bedded with chopped straw or other material that has high insulating properties. Water and feed should be readily available for long trips as described in Federal Regulations.

Truck beds should ordinarily be clean and dry and equipped with a bedded, non-slip floor.

RECOMMENDATIONS FOR THE ENVIRONMENT

Environmental considerations in pork production operations must include the well-being of the pigs, the protection of air and water quality, and the work environment of the producer, and employees.

Social: All classes and groups of pigs form an order of social dominance. These orders are formed by competition soon after birth or when the pigs are first grouped together. Addition of new pigs or regrouping of pigs will usually lead to struggles until a new social order is established. Regrouping of pregnant females should be avoided in early pregnancy to prevent potential harm to unborn pigs. Adult boars that have not been

living together should not be regrouped unless special precautions are taken to prevent possible injury from fighting.

Females can be bred to farrow at any time of the year. Three mating options are: (1) pen mating (placing a boar with a group of sows without observation of matings), (2) hand mating (attended matings with one boar and one sow in a pen), and (3) artificial insemination (utilizing semen collected from boars).

During gestation sows may be housed individually or in groups. They can socially interact more when kept in groups than when housed individually. However, fighting among sows housed in groups may result in bites and injuries from group mates. Some producers house sows in individual stalls, which protects sows from aggression. Stalls also allow the producer to feed and observe each sow individually to meet her needs and to provide her health care more easily and safety.

Sows can farrow in pens, farrowing stalls, or pasture huts. Pens and pasture huts allow the sow to move around freely but may result in higher newborn piglet death loss because the sow may accidentally crush her newborn piglets (McGlone and Blecha, 1987; Stevermer, 1991). Inclement weather may also contribute to piglet mortality. Stalls, on the other hand, allow the sow to stand, lie, eat, and drink, but not to turn around. Restricting the movement of the sow in some manner during lactation allows the piglets more opportunity to escape being crushed when the sow lies down.

Weaning most often takes place at 3 to 5 weeks of age. When a warm, dry, and draft-free environment is provided along with proper nutrition, early weaning may be very successful and not detrimental to the growth, health, and well-being of the piglets. Earlier weaning may also reduce the stress placed on sows and gilts as older and heavier piglets continue to nurse. Nursery systems include housing and management arrangements for newly weaned pigs. Typically, pigs stay in a nursery from weaning until they are 8 to 10 weeks old.

Growing and finishing pigs are those from about 50 pounds to market weight. In environmentally controlled housing, typical growing and finishing pens are rectangular and contain approximately 10 or more pigs.

Space recommendations, pen densities, and stall sizes for swine have been summarized by the NPPC (1999).

Thermal: In outside lots or pastures, trees or other natural objects, if available, can provide adequate shade. Facilities to provide shade can be constructed to also serve as protection from wind and cold during winter. Adequate dry bedding must be maintained during cold weather.

Ventilation typically is the primary means of maintaining the desired air temperature and humidity for pigs housed in buildings. The amount of ventilation depends on the size, number, type, age, and dietary regimen of the pigs, the manure management system, and atmospheric conditions.

Appropriate effective temperatures for pigs have been summarized by NPPC (1999).

Air quality: Air quality refers to the effects that the air has on the health and well-being of animals. Gases, dusts, and microorganisms are produced in pig facilities, and, to a lesser extent, in outdoor operations. Undesirable gases and dust in the air should be controlled so that they do not create air quality problems in or around buildings. Acceptable air quality can usually be achieved with proper ventilation and air distribution, regular cleaning and sanitation, feed dust control, and manure gas control.

Photoperiod: Lighting should give enough illumination to permit practicing good husbandry, inspecting the pigs adequately, maintaining their well-being, and working safely (MWPS, 1992). Compared with some species, the domestic pig is less sensitive to its environmental lighting and no particular daily photoperiod is necessary.

FACILITIES AND EQUIPMENT

Swine housing systems may be as simple as a fenced pasture with no man-made shelter, or they may be much more complex. Whatever the system, it should be appropriate for the age of the pigs and the local climate. In enclosed structures, the system should be capable of maintaining environmental conditions within an acceptable range. Descriptions of cold and warm housing systems have been given by NPPC (1999).

Swine facilities should conform to applicable building codes unless deviations and variances are justified and approved. Physical facilities should be well maintained and clean. Facilities and equipment should be inspected, repaired, and maintained regularly to provide a safe environment for animals and people. The MWPS publications, the Pork Industry Handbook (2001), and publications of other organizations provide guidance for planning, specifications, cost estimates, and construction of commercial agricultural swine facilities in different parts of the U.S.

Feeders and waterers: Feeders should provide adequate access to feed. The design of the feeder should take into account the eating stance and size of the pig using it. Feeders should be cleaned regularly to prevent feed accumulation and spoilage, and be maintained with no rough edges to injure the pigs. Waterers should be positioned to ensure pigs have adequate access. Flow rates should be such that pigs can easily meet their water intake requirements.

HEALTH CARE AND MEDICAL PROCEDURES

Adequate health care is an essential part of a pork production enterprise. Appropriate health care involves: methods to prevent, control, diagnose, and treat diseases and injuries; training of and guidance to animal caretakers on antibiotic therapy; instruction on proper handling of pharmaceuticals and biologicals and withdrawal times; and adequate record keeping programs. Animals should be observed daily for signs of illness or injury.

Methods of prophylaxis, diagnosis, therapy, and disease control should follow currently accepted practices. Assistance of a veterinarian in establishment of a health care program is recommended.

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GENERALLY ACCEPTED AGRICULTURAL AND MANAGEMENT PRACTICES FOR DAIRY

MANAGEMENT OVERVIEW

Michigan's female dairy cattle population consists of approximately 301,000 mature dairy cows and 280,000 calves and heifers. The remainder of the dairy population consists of castrated calves used for veal, dairy steers raised for beef and approximately 4,000 bulls used for breeding purposes. Proper care of dairy animals consists of providing a clean, comfortable environment, adequate access to quality feed and water while employing management techniques designed to limit injuries, diseases and disorders. Proper care of animals can be maintained with either confinement or pasture management systems.

Dairy cows, because of milk production, have special needs that require proper management every day. Calves and heifers should be managed to minimize health problems and to provide for adequate growth and development. Application of sound management practices will result in healthy dairy cows, and healthy, properly grown calves and heifers.

MANAGEMENT PRACTICES

Management practices on a dairy farm are specific for five classes of dairy cattle; calves, heifers, dry cows, lactating cows, and bulls. Calf mortality and morbidity from birth to weaning can be minimized by utilizing sound management practices (Raising Dairy Heifers for More Profit). Calves should be born in a clean, dry environment and receive an adequate amount (3-4 quarts) of quality colostrum soon after birth. Calves are normally removed from their mothers as soon as the calf's hair coat is dry. Calves remain much healthier when housed individually in a clean, properly ventilated environment (MWPS #7). Young calves are normally fed milk or milk replacer during the first 6-8 weeks of life. Amount of feed and times fed per day should increase as temperatures decrease in the winter.

Calves are normally weaned when adequate intake of dry feed has been reached (NRC 2001). Weaned calves should have access to fresh water and adequate feed to support an appropriate growth rate. Proper heifer growth can be achieved with varied management systems (Raising Dairy Heifers for More Profit). Heifer and intact male calves can be housed together from 2-6 months but bull calves should be separated after that to prevent early pregnancies. Heifers should be managed in groups to insure adequate access to feed and water. The number of groups will depend on herd size.

Each group of heifers should be fed a balanced ration (NRC 2001) to maintain adequate growth.

Underfeeding delays normal heifer development. Overfeeding may result in overly fat heifers that may cause health problems at first calving.

Heifers may be bred upon reaching an adequate size and weight (Raising Dairy Heifers For More Profit). Use of artificial insemination or natural service (bull) is an acceptable practice to breed heifers and/or cows.

Proper management of the lactating cow starts during the dry period. Since approximately 70% of health problems in a dairy herd are associated with calving, proper management of precalving, calving and post calving periods will improve the health of mother and calf. An environment should be provided for bred heifers and dry cows that keeps the animals clean and dry. In addition, a good nutrition program that maintains appetite and feed intake should also be provided.

Nutrition programs for dairy cows should provide for adequate intake of the essential nutrients needed for maintenance, growth, milk production and proper development of the fetus (NRC 2001). Grouping cows according to nutrient needs will improve the odds of meeting the requirements of any particular cow. Good quality, fresh water must be available at all times.

Cows benefit from a dry period prior to a subsequent lactation (Managing the Milking Herd for Profit). Restricting feed and water intake a few days prior to dry off are acceptable practices that will aid cessation of milk secretion and improve udder health.

Nutrition for the majority of dry cows should be a maintenance program according to NRC requirements (NRC 2001). Nutrition and housing needs will change 2-3 weeks prior to calving as outlined previously.

TRANSPORTATION

Safety and comfort of dairy cattle should be the primary concerns in their transportation. Weak and unhealthy animals should be separated from healthy animals during transport. Animals should be provided with adequate ventilation and a floor surface to minimize injuries. Recommendations on facility designs for loading and unloading trucks are available (MWPS #7, Caring for Dairy Animals Reference Guide). Transport and handling stresses can be aggravated greatly by adverse or rapidly changing weather conditions.

RECOMMENDATIONS FOR THE ENVIRONMENT¹

Proper management of the environment enhances animal production and minimizes animal disease, death loss, and behavioral problems. Dairy cattle are bred for growth, production, and reproduction in a variety of environments to which they can readily adapt. They can be raised outdoors on pasture, dry lot, and in hutches, or indoors in stalls and pens.

Environmental temperature affects an animal's comfort that, in turn, affects an animal's behavior, metabolism, and performance. Even though cattle are adaptable and can thrive in almost any region of the world, they must be protected from heat and cold stress caused by extreme weather events. Access to shelter can be beneficial even in moderate climatic regions. Heat stress adversely affects animal comfort as does cold stress. Windbreaks, sunshades, or solid-roofed shelters are needed if trees or other landscape features do not provide adequate protection from winter storms and extremely cold or hot temperatures. Sunshades, sprinklers, misting, fans, and other methods of cooling, as well as dietary alterations, will reduce heat stress during hot weather. Air temperature, humidity, quality, and movement should be considered to ensure animal comfort and prevent diseases.

FACILITIES AND EQUIPMENT

Housing for calves, heifers and cows varies widely. However, each housing facility should provide adequate space per animal for eating, drinking and resting (MWPS Freestall Housing and Equipment or Hoard's Dairyman's Plan Guide for Freestall Systems or Planning Dairy Stall Barns NRAES/NDPC-37). Calf housing systems are varied but it is recommended that calves be housed individually with cold housing preferred. Cold housing ranges from calf hutches to larger naturally ventilated barns. Bedding should be kept clean and dry.

Adequate housing for heifers can range from bedded packs to free stalls to pasture. Housing should be well ventilated and keep heifers clean and dry. Heifers should be protected from winter winds. Summer resting areas may need shade.

Feed bunks or feeding areas should be designed to allow animals to eat with a natural motion. Watering sites should be easily accessible to provide adequate water intake without risk of injury. Adequate feed space per animal should be provided (MWPS #7).

Milking equipment should be designed, installed and maintained correctly to provide for maximum comfort of the cow at milking (Milking System Design and Performance). To eliminate the potential of stray voltage at time of milking, feeding or watering, guidelines for proper wiring of a farm should be followed (USDA Handbook No. 696).

¹Condensed from environment chapter in Caring for Dairy Animals Reference Guide, 1994.

ANIMAL HANDLING AND RESTRAINT

Facilities designed specifically to handle dairy cattle, including bulls for AI, hand mating, health checks or treatment, vaccinations, weighing, or hoof trimming will decrease risk of injury to cattle and people as well as reducing the stress of handling. All traffic areas should have non-skid surfaces that avoid causing excessive hoof wear. A number of restraint devices are acceptable, such as halters, hobbles, breeding chutes, squeeze chutes, headlocks, tables and stanchions. Restraint should be the minimum necessary to control the animal and ensure the safety of attendants. Proper design of the handling facility will facilitate animal movement.

HEALTH CARE AND MEDICAL PROCEDURES

Proper care of dairy animals includes the establishment of a herd health program that covers all ages of cattle and emphasizes disease prevention. Dairy farmers should establish a valid veterinarian/client/patient relationship with a licensed veterinarian to assist them in providing proper health care to their herd. A herd health program should include proper ID of all cattle and accurate records.

Suggested husbandry procedures such as castration, dehorning, removal of extra teats, etc. should be carried out by skilled personnel. These procedures are best done when calves are small, but may be done at other times. All procedures should follow the veterinarian's recommendations or accepted management practices. These techniques can be done with little discomfort to calves, heifers or cows (Seykora, 2nd Edition).

Health programs for heifers are designed to prevent disease and increase efficiency of growth. Heifers should be vaccinated against diseases as deemed necessary by the herd veterinarian.

Health programs including vaccinations for dairy cows are an extension of the heifer program. External and internal parasites need to be controlled. Pasturing may increase risk of internal parasites and will increase exposure to diseases carried by wild animals. An ongoing preventive herd health program designed for each farm by the veterinarian and farmer will result in healthy cows.

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GENERALLY ACCEPTED AGRICULTURAL AND MANAGEMENT PRACTICES FOR EQUINE

MANAGEMENT OVERVIEW AND HUSBANDRY SYSTEMS

The equine industry in Michigan is large and diversified. Management systems include: Breeding farms; training facilities; show, exhibition, and racing enterprises; mare and foal operations; transportation companies; horses used for work on farms or for transportation; boarding stables, pleasure horse operations and riding stables. Equine management systems include operations with only a few animals to those with several hundred on one premises. The industry has state-wide distribution and the various components are integrated to provide specialized services. The show and racing operations accommodate horses throughout the country, therefore, a large number of horses are transported into and out of this state on a regular basis.

The weather changes and climate extremes of this state present possible management and health problems which need to be considered and managed for the care of horses. Housing and pasture systems may vary and be modified to meet the needs of the enterprise, to use existing facilities, and to be economically feasible. Safety emphasis and minimizing stress are important factors when transporting one or several horses. Herd health and preventive disease and injury programs should be individually developed and implemented for each equine operation. These programs need to be reviewed and altered as disease potential and needs change. Since horses are athletes and perform different tasks, nutritional programs need to meet the growth and performance requirements of each horse.

Federal and state laws concerning horse protection, animal cruelty, riding stables, and sale barns need to be understood by the industry, complied with, and enforced.

MANAGEMENT PRACTICES (INCLUDING TRANSPORTATION)

Nutrition: Proper nutrition is important in maintaining health. Nutritional demands vary depending on age, size, and use. The amount and composition of feed required is governed by body weight, individual metabolism, age, pregnancy, lactation, and the amount of work the animal does. Horses need to be adequately fed to maintain their body weight and health, however, idleness, overfeeding, and obesity are undesirable and often harmful. Horses are kept for a much longer time than most farm animals and feeding programs should support the development of sound feet and legs that will sustain a long and athletic life.

Nutritional demands are usually met with good quality, properly harvested forages and roughages combined with grains and supplements as needed to balance the diet. Horses utilize hay or other roughages more efficiently than do other non-ruminants; however, consistency and nutrient quality are essential for optimum productivity and health. Because horses are particularly sensitive to toxins found in spoiled feeds, grains and roughages should be of good quality and free from visible mold. Feeding of dusty feeds should be kept to a minimum because of their tendency to initiate or aggravate respiratory problems.

When horses are fed in groups, adequate feeding space should be provided so that dominant animals do not prevent others from eating. Horses should be fed regularly, and since they have a relatively limited capacity for roughage at any one time, they should have frequent access to it. A horse should be rested after eating before strenuous work starts.

Availability of clean water is essential. Water requirements depend largely upon environment, amount of work being performed, the nature of the feed, and the physiological status of the horse. Following exercise, the horse should cool down before unlimited access to water is allowed.

Transportation: Trailers and vans should be free of protruding objects on the sides and top and should be of adequate height for the animal. When appropriate, protective devices such as helmets, leg wraps, boots, blankets, and tail wraps can be used to further protect the animal from injury.

Available hay in the trailer will help prevent boredom during transit. Suitable non-slippery flooring, e.g. rubber mats, straw, shavings, or a combination of these, should be available for transits. The vehicle exhaust system should not pollute the air inside the stock crate. When trips are over 24 hours, an ample rest stop, fresh feed and water should be given. On shorter trips, a walking rest stop with water may be appropriate depending on the length of the trip.

For the safety of the equine and handlers, the tranquilization of horses during transit is acceptable. Products should be administered by a person knowledgeable about the product and in consultation with a veterinarian. Administration of mineral oil may be helpful in preventing intestinal stasis during long trips.

Training: Horses in training, exhibition, racing and work should be treated in a humane manner. The acceptable standards for training, exhibition, racing and work are those which an informed and recognized equine association (e.g. The American Horse Shows Association Rule Book 1994-1995, and American Quarter Horse Association Official Handbook, 1995) has developed and shall be in compliance with the Federal Horse Protection Act and Michigan cruelty to animals laws.

RECOMMENDATION FOR ENVIRONMENT

Proper illumination in barns and indoor riding arenas are important for the convenience and safety of both the horse and the attendant.

As a rule, horse owners can obtain adequate housing for their horses with uninsulated buildings. In northern regions, insulated buildings and supplemental heat are more commonly used to protect the animals and attendants from severe winter weather. Heated barns may be used for show horses to keep them in show condition throughout the year. Overcrowding should be avoided to minimize injuries and parasite problems.

Pastures should have adequate shelter where horses can get out of the sun, wind, rain, and other inclement weather. These may include, but are not limited to, open barns, lean-to's, and woodlots. There should be enough space to accommodate all animals comfortably. Riding stables licensed by Michigan Department of Agriculture are required to have constructed shelters per R285.154.5.

FACILITIES AND EQUIPMENT

The basic purpose of horse housing is to provide an environment that protects the horses from temperature extremes, keeps them dry and out of the wind, eliminates drafts through the stables, provides fresh air in both winter and summer, and protects the horses from injury. See reference section for more information on general housing requirements.

In cold uninsulated or insulated barns, fresh air is usually provided by natural air movement through wall openings and ridge vents or devices. Examples of wall openings may be small windows, wall panels, or slats under the eaves. In tight, warm barns, fans, and spaced air inlets may be necessary.

In most horse barns, some box stall space is necessary for sick animals, mares at foaling time, and foals. Stall walls should be tight, smooth, and free of loose wires, protruding bolts and nails, and anything else that might injure the horse as it moves about and lies down.

The walls should be flush with the floor, so a horse cannot get its feet under the partition. For riding horses a possible example of a typical box stall would be 10' x 10'. Stalls of 16' x 20', or larger, are useful for foaling mares. Box stalls for ponies and miniature horses may be smaller, depending on the size of the animal.

Tie stalls require about half the area, use less bedding, are easier to clean than box stalls, and can often be constructed in existing buildings suitable for box stalls. A possible example of a typical tie stall is 5' x 9' (3' x 6' for ponies and miniature horses),

although stall lengths up to 12' are often used. For either box stalls or tie stalls, construction materials must be strong enough to contain the animal.

Packed or puddle rock-free clay on a well-drained base make comfortable and practical floors for stables. However, they are difficult to keep clean and have to be renewed from time to time. Wood plank stall floors or wood block floors on concrete are preferred by some, but such floors are difficult to keep dry and free of odors. Concrete floors are the least desirable, and if used, a considerable amount of bedding is needed. Floor finishes that are slippery should be avoided.

Common fencing materials are wood, pipe, PVC, electrical wire or tape, smooth, non-electrical wire, rubber belt and diamond woven wire (mesh that a foal cannot get its feet through). The fence should be free of sharp projections, such as nails, bolts, and latches. Fences should be approximately five feet in height for light horses. Overcrowding in pastures and lots should be avoided to minimize injuries due to kicking and fighting.

Bands of horses may be housed in open sheds. If halters are left on in the pasture, they should be of a material that will break if the halter becomes caught on an object.

Where animals are stabled or yarded for any lengthy period, clean bedding should be provided.

HEALTH CARE AND MEDICAL PROCEDURES

Disease and injury prevention can best be achieved through nutritional management, adequate housing, vaccination programs, parasite control, cleanliness, and general equine husbandry in consultation with a veterinarian.

A healthy horse is active, and drinks readily, has clear eyes and nose, a clean skin and a good general body condition without being excessively fat. The health of the horses should be routinely assessed to recognize appropriate signs of illness so that care may be instituted. Management plays a major role in the prevention of disease and injury.

A proper preventive vaccination program should be developed for individual horse needs. Effective vaccines are available to protect against many of the serious infectious diseases of horses including: Tetanus, encephalomyelitis, influenza, rhinopneumonitis, strangles, viral arthritis, PHF and rabies. The manufacturer's and/or veterinarian's recommendations should be followed for all vaccines.

Internal parasitism is one of the most serious of all equine diseases. Parasitism is associated with general unthriftiness, poor hair coat, and a high incidence of colic. Stable and pasture management can be helpful in parasite control. A parasite control program should be developed and implemented for all horses.

Horses' teeth should be examined periodically and floated when necessary. Elongated enamel points on the teeth can cause trauma and constant irritation and result in improper chewing. Excessive salivation or dropping of feed from the mouth indicate the mouth should be examined and may indicate that dental care is needed.

Proper foot care is essential to maintain normal health of the foot and to prevent lameness. The hooves should be examined regularly and trimmed or shod as needed. For stabled horses, clean, dry bedding should be maintained. Excessive dryness of the hoof should be avoided.

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ADDENDUM: CURRENT STATE AND FEDERAL LAWS

Michigan Public Act 70 of 1877, as amended, MCL752.21--Whoever overdrives, overloads, overdrives when overloaded, overworks, tortures, torments, deprives of necessary sustenance, cruelly beats, mutilates, or cruelly kills, or causes or procures to be so overdrive, overloaded, driver when overloaded, overworked, tortured, torments, deprived of necessary sustenance, cruelly beaten, mutilated, or cruelly killed, any animal, and whoever, having the charge or custody of any animal, either as owner or otherwise,

inflicts unnecessary cruelty upon the same, or willfully fails to provide the same with proper food, drink, shelter, or protection from the weather, is guilty of a misdemeanor.

Michigan Public Act 93 of 1974, MCL287.112--A person, firm, or corporation shall not own or operate a riding stable (any establishment in which, for business purposes, 6 or more horses or ponies are rented, hired, or loaned for riding) or sale barn (any establishment where horses or ponies owned by others are sold or offered for sale) without first having obtained a license. A person who violates this act is guilty of a misdemeanor.

Michigan Public Act 466 of 1988, (amended 1996) MCL287.739--A facility for exhibition of livestock shall be constructed to allow sufficient separation of each exhibitor's livestock. The facility shall be constructed of a material that can be adequately cleaned and disinfected. An exhibition building or yarding facility shall be cleaned and disinfected with USDA-approved disinfectant used in accordance with label instructions before livestock are admitted by removing from the premises all manure, litter, hay, straw, and forage from pens, runways and show rings, and thoroughly disinfecting walls, partitions, floors, mangers, yarding facilities, and runways in a manner approved by the director.

Michigan Public Act 328 of 1931, as amended (Michigan Penal Code), MCL750.60 Docking Horses Tails--Any person who shall cut the bone of the tail of any horse for the purpose of docking the tail, or any person who shall cause or knowingly permit it to be done upon the premises of which he is the owner, lessee, proprietor or user, or any person who shall assist in or be present at such cutting, shall be guilty of a misdemeanor, punishable by imprisonment in the county jail of not more than one year or by a fine of not more than 500 dollars: Provided, that such cutting of the bone of the tail of any horse for the purpose of docking the tail shall be lawful when a certificate of a regularly qualified veterinary surgeon shall first be obtained certifying that such cutting is necessary for the health or safety of such horse.

The federal Horse Protection Act was passed in 1970 and amended in 1976. The legislation is aimed at stopping the cruel and inhumane practice of having horses take part in a horse show or sale while they are "sore." A horse is deemed to be sore if it suffers abnormal pain, distress, inflammation, or lameness when it walks, trots, or otherwise moves. Generally, soring refers to any application, infliction, injection, or practice which makes a horse sore in a way that exaggerates its gait, producing a flourish prized by show judges and viewers. The laws forbids the entering of sore horses in shows, exhibitions, sales, or auctions; permitting such an entry to occur; and transporting horses for such an entry. Regulations further forbid acts that may cause horses to become sore at regulated events. Criminal offenses are prosecuted in federal courts.

SPECIFIC REFERENCES

Cruelty to Animals, Michigan Public Act 70 of 1877, MCL752.21-752.30.

Horse Riding Stables and Sale Barns, Michigan Public Act 93 of 1974, MCL287.111-287.119.

Animal Industry Act, Michigan Public Act 466 of 1988 as amended, MCL287.701-287.747.

Michigan Penal Code (Excerpts), Michigan Public Act 328 of 1931, as amended, MCL750.49-750.70.

The Horse Protection Act, Code of Federal Regulations, Title 9, Chapter I, Subchapter A, Part II.

GENERALLY ACCEPTED AGRICULTURAL AND MANAGEMENT PRACTICES FOR PRIVATELY OWNED CERVIDAE

MANAGEMENT OVERVIEW

The Michigan Animal Industry Act, P.A. 466, describes captive cervidae (hence known as privately owned cervidae) as members of the cervidae family including, but not limited to, deer, elk, moose, reindeer and caribou living under the husbandry of humans. Because of their unique behavioral characteristics, a high degree of skill and sensitivity need to be exercised when raising deer in captivity. Deer are generally less easy to tame than other domestic species and, therefore, have special management, environmental, facility and health care requirements. Though exact husbandry systems may vary by species and/or location, all farmed deer require adequate nutrition, shelter, holding/handling facilities, and health management.

MANAGEMENT PRACTICES

Handling: Handling deer requires care and caution to minimize undue noise and/or commotion, thereby avoiding over-excitement of the animals. To minimize stress, handling should occur as infrequently as possible. Routine management procedures such as weighing, identification, vaccination, and anthelmintic (dewormer) administration need to be carefully scheduled and performed simultaneously when feasible. To decrease the chances of animal or human injury during handling, antlers may be removed before the onset of rut. Handling equipment designed specifically for use with captive cervidae should be used.

Nutrition: Adequate feed and water are vital to all animals and farmed deer provide no exception. Access to clean, fresh drinking water is essential for all deer. Nutritional requirements vary both between and within species. There are differences between those species that are primarily grazers and those that prefer to browse. Within species, nutritional requirements differ among adult males, adult females, and growing animals. In addition, seasonal variation exists within each of these animal classifications.

Reproduction: Reproductive characteristics vary somewhat between deer species, but all are highly seasonal. Important management considerations to achieve good reproductive performance include: Paddock size and female:male ratio during breeding; aggressive behavior by males in the rut; normal parturition (birthing) behavior;

environmental needs of newborns; and special requirements at weaning. Information from experienced individuals and/or reliable published sources can be valuable (see references).

Transportation: Transporting deer successfully requires specific attention to several important details. It can be helpful to separate deer according to species, age, and sex. Quiet handling and darkened transport crates or trailers tend to enhance outcomes.

Adequate ventilation is required, and confinement during transport for over 12 hours necessitates provision of feed and water. Extra caution should be exercised in transporting the following deer and should be done only when the deer's welfare is at stake: 1) males with antlers in velvet; 2) females due to give birth within two months; and 3) lactating females and offspring when those fawns/calves are less than one month of age. Finally, transportation of deer should be avoided in extremely hot weather to minimize associated stress.

RECOMMENDATIONS FOR THE ENVIRONMENT

Farmed deer can be successfully raised under a wide variety of systems. Their environmental needs vary from those of major livestock species based mainly on their behavioral differences. Accordingly, requirements often differ among individual deer species. For example, paddock size and stocking density should be determined by species preference toward social and gregarious behavior, and the relative proportions of open pasture and forested land should be based on species preference for browsing vs. grazing. Deer must become habituated to their environment, and disruptions by people, other animals, or machines should be minimized. Newborn deer require cover for hiding and shelter from inclement weather in some situations. Though most deer are quite tolerant of climatic fluctuations, provision of shelter to temper climatic extremes can be beneficial. As with other aspects of deer farming, environmental design should utilize expert input.

FACILITIES AND EQUIPMENT

For the most part, the facilities and equipment needed for deer farming are dictated by the requirements in handling, nutrition, reproduction, transportation, and environment. Fences should be tall enough to avert jumping by the species of interest, and sharp protrusions in the confined areas should be strictly eliminated.

HEALTH CARE AND MEDICAL PROCEDURES

In managing the health of farmed deer, aggressive prevention of disease and injury is much preferred to treatment. Reliable success with both prevention and treatment is more likely if a veterinarian skilled in deer management is involved. Adherence to regulatory requirements must be observed in the transport and transfer of deer. Development of a herd-specific health management program in consultation with a local veterinarian is recommended. This program should incorporate routine herd health evaluations appropriate

for the particular management, environment, and facilities involved. Vaccination, anthelmintic administration, antler removal, and other health management practices can then be appropriately executed in a timely manner.

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GENERALLY ACCEPTED AGRICULTURAL AND MANAGEMENT PRACTICES FOR VEAL

MANAGEMENT OVERVIEW

Most veal comes from dairy calves. Four classes of veal are now recognized in the United States: Bob veal, grass-fed veal, heavy or Western veal, and formula-fed veal (also known as milk-fed or special-fed) (Schwartz, 1990). Formula-fed veal is the most common in Michigan and these recommendations will be specific to this type.

MANAGEMENT PRACTICES

Veal calves should be handled with special care, gentleness, and patience, a recommended management practice for all dairy calves. Until they are selected for veal production systems, they should receive the same husbandry practices as dairy replacement heifers. Young dairy animals not intended for dairy herd replacements or formula-fed veal, should follow the beef management recommendations.

It is recommended that veal producers observe calves several times a day. The herds person should monitor the feed intake and health of each calf (Guide for the Care and Production of Veal Calves).

Individual stall housing is a management recommendation for formula-fed veal production to minimize calf-to-calf contact which limits the spread of infectious diseases (Guide for the Care and Production of Veal Calves). This management practice is important, considering that veal calves are usually grouped together from many dairy farms, and the calves may have been exposed to disease at the collecting facilities.

Diets should be formulated to meet nutrient requirements for both maintenance and growth (NRC, 2001). Feeding calves individually assures that competition among animals does not result in some animals receiving insufficient quantities of feed. More efficient growth results because the farmer can feed calves differently, depending on weight, appetite, and individual calf differences.

Veal facilities should be equipped for ease of loading, unloading and transporting of calves (Modern Veal Production). Animal well-being is an important consideration during transport regarding space requirements and duration of trip.

RECOMMENDATIONS FOR THE ENVIRONMENT

A clean, dry, draft-free building or outside surrounding is recommended for animal comfort and performance. Ventilation rates in winter should be sufficient to remove moisture produced in the building. Rates should be increased as the weather warms to provide temperature control. Recommendations for calculating ventilation rates are similar to those for dairy calves in warm housing (Midwest Plan Service, 1995). It is important that the building air inlets are properly positioned and can supply the airflow for the exhaust fans when veal calves are housed indoors.

Thermostats can be effectively used for automatic control of the fans and temperature. Heating and ventilation systems should be planned simultaneously. Control of temperature is important to the health of calves, and is a factor in feed conversions. Michigan's climate can be erratic; therefore, producers should attempt to provide a comfortable temperature and level of relative humidity. Sudden fluctuation in temperature should be avoided.

During daylight periods, natural or artificial indoor lighting intensity should allow for every housed calf to be seen clearly for inspection (Guide for the Care and Use of Agricultural Animals in Agriculture Research and Teaching 1988).

FACILITIES AND EQUIPMENT

The internal surfaces of barns and holding systems for veal calves should be made of materials that can be cleaned and disinfected effectively and routinely. Surfaces of barns, stalls, pens, and other equipment accessible to the calves should have no sharp edges or projections. All floor surfaces should be designed, constructed, and/or maintained to avoid injury or stress to the calves.

Formula-fed veal calves usually are raised in individual stall housing. Stall dimensions should be sufficient to allow a calf to stand, stretch and lie in a natural position. (Schwartz, 1990)

HEALTH CARE AND MEDICAL PROCEDURES

Individual stalls for veal calves are recommended for health reasons in contrast to housing of dairy replacements in groups. Calves housed individually can be observed more closely, facilitating early detection of problems. Disease spread is reduced because of reduced calf-to-calf contact and cross-suckling (Raising Dairy Heifers for More Profit 1987).

Preventive and therapeutic health programs, and medical procedures including castration and dehorning should follow a veterinarian's recommendation.

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GENERALLY ACCEPTED AGRICULTURAL AND MANAGEMENT PRACTICES FOR SHEEP & GOATS

MANAGEMENT OVERVIEW

The sheep industry is segmented into four major groups. Commercial flocks produce market lambs and wool, the lamb feeding industry specializes in market lamb production, the registered flocks produce breeding stock and exhibition animals, and the small, special interest flocks are involved in specialty fiber production, rare breeds, hobby farming, etc. The majority of commercial flocks produces their own replacement ewes, and purchase rams from other breeders. In some expansion flocks, producers will purchase breeding ewes. Sheep are often integrated into mixed farming operations, and thus can be fed on crop residues, and used for weed control.

The goat industry is considerably smaller than the sheep industry and is divided differently. There is a very small number of Grade A dairy farms, and the rest of the dairy goats are kept in small herds for home milk production, 4-H youth projects, and exhibition. Angora goats are kept for hair production. The meat goat industry is a by-product of the Angora and dairy goat herds. Unless otherwise indicated, practices identified for sheep, also apply to goats.

MANAGEMENT PRACTICES AND TRANSPORTATION

Sheep are seasonal breeders and the majority of them will breed only in the fall and lamb in the spring. There are two management systems in place which ensure a more uniform supply of market lambs. The first is to lamb early in the year, in the barn, feed a concentrate diet designed for rapid growth and sell lambs in June or July. The second option involves lambing later, feeding the lambs on pasture and conserved feed and selling the lambs in late summer, fall and winter. The requirements for housing, feeding and stockmanship are quite different for each approach. Sheep on pasture are at risk from predators and should be observed regularly.

Sheep at all stages of production should be fed and watered in a consistent manner to supply requirements as established by the National Research Council publications on Nutrition Requirements for Sheep (NRC – Sheep, 1985) or Goats (NRC – Goats, 1981). Sufficient forage should be available to support weight gain in growing lambs. Non-lactating ewes may need to have their intake reduced in order that they reach the appropriate body condition during specific phases of the reproductive cycle.

Continuous access to clean fresh water is important for lactating ewes and lambs on high grain diets. In a large flock, this may mean multiple access points in a confinement operation. Sheep with lower water requirements do not need continuous access to water.

Sheep that are raising lambs housed in a barn in the winter require a high level of stockmanship. Prolific sheep will raise the required level of stockmanship even further. Goats are seasonal breeders like sheep. Generally the angora flocks are kept under pastoral conditions, whereas the dairy herds are handled in a more confined way, and fed on stored feeds.

Transportation of sheep and goats should be handled with regard to climatic conditions and productive stage of the animals. Care should be exercised in the transport of animals during conditions of high temperature and humidity. Appropriate measures should be taken to reduce the risk of pregnancy toxemia and transport tetany when moving sheep and goats. An adequate supply of nutrients immediately prior to transport is helpful in reducing hypocalcemia or transport tetany of sheep. Excitable animals should be gated-off into groups to prevent pile-ups and death losses.

RECOMMENDATIONS FOR THE ENVIRONMENT

Sheep and goats in Michigan should receive protection from the winter climate through some kind of shelter, usually a building, although woodlots which reduce wind speed may be appropriate. Provision of extra feed and protection from wind and precipitation is necessary if animals are in danger of experiencing hypothermy. In intensive production facilities, ventilation should prevent moisture condensation during cold weather and excessively high temperature during hot weather. Shearing of sheep reduces the moisture load during winter housing. Newly shorn sheep are susceptible to hypothermy, hyperthermy, and sunburn, so appropriate shelter may need to be provided and frequency of observation increased.

Newborn lambs and kids are very susceptible to hypothermy, and they should be moved to areas within their respective thermoneutral zones as soon as possible. A draft-free environment should be provided during very cold or wet conditions. Zone heat may be used short term in extreme conditions or for weak lambs. When shelter is not available, lambing and kidding dates should be planned to minimize the possibility of subjecting newborn lambs and kids to cold or wet weather.

FACILITIES AND EQUIPMENT

Pastures should be fenced to minimize predator entry and reduce escapes and entrapment of horned or heavily fleeced animals in the fence itself. Innovations in fencing have made this task easier. Dry lots should be of sufficient size and well drained to prevent excessive mud during times of prolonged rainfall.

Minimum space recommendations for sheep in confinement can be found in the Midwest Plan Service, Sheep Housing and Equipment Handbook (MWPS, 1994). Feeders should be designed to avoid waste and minimize fecal contamination of feed. Feeder designs for sheep are often inappropriate for goats. For this reason, sheep and goats are not usually housed together in close confinement. Additionally, horned goats tend to dominate polled goats and sheep in general. Extra space must be allowed when horned animals are kept.

Well designed, well lighted facilities can aid in minimizing stress to the animals and the livestock attendants. Sheep have a strong flocking instinct and handling systems take advantage of this. Possible causes of accident or trauma to the animals or handlers should be eliminated. Gates and feed room doors should be securely fastened with livestock-proof latches to avoid illness and/or deaths that occur when animals suddenly have access to large amounts of food.

Good stockmanship can compensate for suboptimal facilities, but the provision of well-designed facilities enables the good stockmanship to be even more effective in the care of the animals.

HEALTH CARE AND MEDICAL PROCEDURES

A health care program should be based on the provision of adequate nutrients to meet the animals' particular needs. Mineral deficiencies exist in certain localized areas, and these should be corrected. Mineral toxicities, such as copper poisoning, should be avoided by recognizing and minimizing the excess dietary intake.

Housing animals during the winter increases the risk of disease incidence and transmission, and particular attention should be paid to the ventilation system, to ensure that the environment is as clean, dry and draft-free as possible.

A health care program should be devised for the particular flock, taking into account the management system, the climate and the degree of exposure. A program for an exhibition flock in confinement housing would be different from a pasture lambing operation, with a closed-flock policy. Parasite control is extremely important especially when sheep and goats are at pasture. Frequent observation is necessary during periods of high risk from fly-strike. Assistance of a veterinarian in establishing a health care program is recommended.

Parasite control programs should be devised for each particular farm, with the recognition that programs that work for sheep may not be effective for goats on the same farm. Husbandry procedures, such as disbudding, castrating and docking, should be

carried out by skilled personnel, while the animals are still small, preferably during the first week. This should not be done on the first day of life, as this may interfere with colostral intake. Adequate colostral intake is important for disease resistance in young animals.

Animals that are lame should be treated promptly to minimize pain or distress. Foot rot is a contagious disease that is endemic in many flocks. There are sound economic and welfare reasons why foot rot eradication should be carried out. Recognition should be given to the fact that certain sheep and goat diseases are potentially transmissible to people, and appropriate precautions should be taken. Animals that are suffering and/or dying should be treated or killed humanely. All carcasses should be disposed of promptly and in accordance with state and local regulations.

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GENERALLY ACCEPTED AGRICULTURE AND MANAGEMENT PRACTICES FOR LAYING CHICKENS

MANAGEMENT OVERVIEW

Nearly all commercial birds are kept in confinement housing with light control, power ventilation and mechanical feeding. Confinement housing varies from a few birds per house to more than 100,000 birds per house. In addition, there are small flocks that utilize a variety of free range and/or confinement shelters and housing.

MANAGEMENT PRACTICES (INCLUDING TRANSPORTATION)

Nutrition: Feed and clean water shall be available to the birds and when new birds are placed in the system, care must be taken to ensure that the birds find the feed and water sources. Knowing that all birds do not feed or drink at the same time, an average of 2.2 inches of feeder space and 1 inch of trough watering space per bird is acceptable. A maximum of 20 birds per mechanical water cup or nipple is recommended. In situations where high environmental temperatures may be encountered, fewer birds per cup or nipple is recommended.

Laying hens normally enter into a natural molt period after 8-12 months of producing eggs, and therefore, it is considered sound management to induce this molt so that all the birds molt at the same time. To accomplish this molt, it may be necessary to put the birds on a dietary regime in which feed consumption may be restricted for a period of time allowing the birds a period of rest from egg production. As a result of this molting program, the birds' productive life will be prolonged.

Stocking Density: Regardless of the type of enclosure or system of management used, all birds should have sufficient freedom of movement. A minimum of 48 square inches per adult bird or 12 square inches per pound of bird, liveweight, is adequate.

Beak Trimming and Dubbing: Due to the temperament of chickens toward feather picking, fighting and cannibalism, the beaks of domestic birds can be trimmed to remove their sharp tips. Trimming should be done by properly trained workers and should be done at prescribed times.

Partial removal of the comb at one day of age is commonly called dubbing and is an acceptable management practice. It is usually done at the hatchery before shipment of the chicks. In laying strains that develop large combs, dubbing reduces injury and bleeding caused by contact with their peers, as well as cages and/or equipment during feeding and drinking.

Transportation: Safety and comfort of the animals are of prime importance when transporting poultry. Poultry in transit should be provided with proper ventilation for the conditions; clean, sanitized vehicles and equipment; and a floor surface that minimizes slipping.

Chick delivery: The day-old chick delivery vehicle should have the capability of maintaining a uniform temperature of 75⁰F (24⁰C) to 80⁰F (27⁰C) regardless of ambient temperature. Air circulation must be maintained around all chick boxes at all times regardless of their location in the vehicle. The vehicle should not stop from the time it is loaded until it reaches its destination. Provisions for maintenance of proper ventilation and temperature control should be provided in case of vehicle's mechanical failure or any other unforeseen vehicle stop(s). The transportation vehicle should be properly cleaned and sanitized between deliveries.

Adult poultry delivery: When adult poultry are transported, adequate ventilation, space and flooring should be provided. Hot weather is a time for particular caution. The birds should be protected from heat stress by being shaded and/or moved during the dark hours. Prompt unloading and/or auxiliary ventilation is essential when the birds reach their destination.

During transportation in cold weather, birds should be protected by use of windbreaks, partial covering, etc. Ventilation must always be adequate.

RECOMMENDATIONS FOR ENVIRONMENT

Ventilation and Lighting: Ventilation in the layer house should provide a healthy level of moisture, gases and temperature maintained without drafts or dead air pockets.

Lighting should be provided to allow effective inspection of all the birds and sufficient light for the birds to eat and drink. Light intensity within the house should average between 0.125 and 1.0 foot candle during the daily light period.

The housing should provide shelter from disturbing noises, strong vibrations, or unusual stimuli, regardless of origin.

FACILITIES AND EQUIPMENT

Housing: The design, construction and management of a poultry housing system must meet the birds' need for shelter against undesirable environmental conditions such as extreme cold, excessive heat, rain and wind and modify these climatic conditions to conform to an adequate environment for laying hens. They shall be constructed to

minimize transmission of disease, parasites and other vermin infestation and optimize the principles of disease prevention. The housing should also protect the birds from all forms of predators and allow for daily visual inspection and care.

Housing in cages: Cages shall be designed, constructed and maintained to avoid injury to the birds and allow bird comfort and health. The cages must be so constructed as to allow the safe placement and removal of birds. Cage height shall allow a minimum of 14 inches with a floor slope not to exceed 8.5 degrees.

Housing on floors: All flooring shall be designed, constructed and maintained to avoid injury and allow comfort and health to the birds.

Maintenance: When mechanical systems are utilized for feeding, watering, ventilating, egg collecting, manure removal, etc., properly trained personnel shall regularly check the operation of these systems and adjust and maintain them when necessary to prevent injury to the birds and maintain the health and comfort of the laying hens. All aspects of the housing facility must be checked regularly to assure both the structure and systems are operating correctly.

Cleaning of poultry houses: Poultry houses should be cleaned periodically to provide a healthy environment for the birds. The length of time between cleaning depends upon the type of housing, mechanical systems installed, removal of birds from the house and other factors peculiar to each individual farm.

HEALTH CARE AND MEDICAL PROCEDURES

Optimal management practices are essential to maintain good health status in the egg production facilities and may be in consultation with a veterinarian. A program of disease prevention and control should be established. Only federally approved medications and vaccines shall be used, following label directions in accordance with state and federal regulations.

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GENERALLY ACCEPTED AGRICULTURE AND MANAGEMENT PRACTICES FOR DOMESTIC RABBITS

MANAGEMENT OVERVIEW

Rabbits are raised for research, meat, wool, pelts, show, pets, and as a hobby. They are maintained under a wide variety of conditions ranging from single backyard hutches to large environment-controlled commercial production units. Rabbits are adaptable to a wide range of housing and management systems provided their needs for shelter, nutrition, and health care are met.

If rabbits are raised and sold for laboratory use, they must be raised according to the provisions of the Animal Welfare Act. Rabbitries producing rabbits for laboratory use must also be licensed by the U.S. Department of Agriculture.

MANAGEMENT PRACTICES (INCLUDING TRANSPORTATION)

Nutrition: Rabbits must be fed a sufficient quantity of wholesome, palatable feed to meet their nutrient requirements. Each pen should be provided with suitable feed receptacles (typically a crock or metal feeder and a hay manger if loose hay is fed) to allow easy access to uncontaminated feed.

Rabbits must have access to clean, fresh water daily. Water receptacles (crops, water bottles, etc.) or automatic waterers may be used. Frequent watering or use of heating systems should be employed to assure that an adequate supply of drinking water is available to the animals during freezing temperatures.

Handling and Transportation: Proper handling of rabbits will help prevent injury to the animals, as well as to the handlers. Recommended methods for handling and examining rabbits are given in **Rabbit Production** and in the **Domestic Rabbit Guide**.

The safety and comfort of the animals are of prime importance when transporting rabbits. Wire carrying cages are recommended for transporting rabbits. Carrying cages should be of sufficient size to allow the rabbits to turn about freely and make normal postural adjustments. Carrying cages with wire (1/2" x 1") floors suspended above solid bottoms are recommended. Cat carriers are not recommended for transporting rabbits, as rabbits could be injured when removing them from the carrier. Rabbits should be provided with a non-toxic absorbent bedding material to prevent leakage in transit.

Rabbits being transported should be observed frequently and should have access to feed and water (or feed that will satisfy their water needs) if in transit for more than 6 hours. During hot weather, precautions should be taken to guard against heat stress.

RECOMMENDATIONS FOR ENVIRONMENT

It is essential that good sanitation and vermin (insects, ectoparasites, and avian and mammalian pests) control be provided whether rabbits are housed indoors or out-of-doors. The use of screens and approved sprays and baits are suggested to help control insects in the rabbitry. Pens, feed, and watering equipment should be cleaned and sanitized periodically. Accumulations of hair on rabbit pens should be removed. Frequent removal of manure from under the cages will help prevent unpleasant odors and ammonia fumes, as well as, reduce environments that are conducive to insect propagation. All feed and bedding should be stored in bins or containers in a cool, dry, area which would not attract rodents.

FACILITIES AND EQUIPMENT

Housing: Although rabbits may be housed under a variety of conditions, they should be provided a comfortable environment which will limit stress and risk of injury, and afford good ventilation and protection from the elements. If rabbits are raised in outside hutches, the hutches should have water tight roofs. Hutches should be designed to protect the rabbits from wind, snow, rain, sun, and predators, yet allow for sufficient ventilation for removal of hot air in summer and moisture in winter. Hutches suspended above the ground with welded wire floors and sides are conducive to good air circulation and sanitation, as opposed to solid wooden hutches. The size of hutch required will depend on the size and number of the rabbits to be housed (see pens below). Outdoor hutches should be provided with a clean, dry nest.

When rabbits are housed in a building, the building should provide adequate ventilation and drainage to maintain a healthy environment for the animals. Ventilation may be natural or by mechanical means (fans). Typically, in indoor housing, single-tiered, all-wire pens are suspended. Single-tiered pens facilitate animal care and sanitation and are preferred over multi-tiered pens. Concrete or dirt floors with pits under the pens to contain the droppings are recommended for indoor rabbitries. Automatic pit cleaners are desirable but not essential.

Pens: Rabbit pens must be clean, dry, and of sufficient size to allow the animals to perform their normal physiological functions, including rest, sleep, grooming, defecation, breeding, kindling, and raising young. Giant breeds of rabbits require larger pens than the small breeds. Suggested pen sizes for various size rabbits are given by Cheeke et al. and the American Rabbit Breeders Association. Pens should be structurally sound and constructed of durable, non-toxic materials which resist corrosion and are conducive to good sanitation. The pens should be maintained in good repair and afford protection to the rabbits from injury and predators. It is desirable to house rabbits in wire bottom (1/2" x 1" wire mesh recommended) pens suspended above the ground to allow feces and urine to fall through the pen floors and

for ease in removal of these waste products from under the pens. Solid floored pens may be more suitable for some giant breeds of rabbits that are prone to foot problems. Rabbits in wire bottom cages could be given a section of drywall (plaster board) for a resting place and to help eliminate foot problems. Solid floored pens should be provided with clean, dry litter and should be cleaned frequently. Household bleach and sunshine are effective disinfectants.

Bred does should be provided with an adequate sized nestbox in which to raise their young for the first month. The nest box should contain a suitable bedding material and should be placed in the pen a few days prior to kindling. Various types of bedding, including straw, wood chips, crushed/shredded sugar cane, sawdust, and newspaper, can be used. Nest boxes may be constructed of wood, metal, or wire. Disposable liners should be used with wire nest boxes. In non-heated rabbitries during cold weather, well insulated nest boxes should be provided or the does should be moved to a warm area to kindle and raise their litters for the first few weeks. Good nest box sanitation is essential.

HEALTH CARE AND MEDICAL PROCEDURES

Optimal management practices are essential to maintain good health status in the rabbitry. A program of disease prevention and control should be established and may include consultation with a veterinarian. Rabbit breeders should be on the look out for signs of illness.

Any sick or injured animals should be immediately treated, or if necessary, humanely euthanized. Rabbits that are under quarantine or suspected of having an infectious disease should be separated from other rabbits to minimize the spread of disease.

Euthanasia: Euthanasia should be carried out by trained personnel as rapidly and painlessly as possible. Acceptable procedures for euthanizing rabbits include those in the report of the AVMA Panel on Euthanasia.

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GENERALLY ACCEPTED AGRICULTURE AND MANAGEMENT PRACTICES FOR FARM-RAISED MINK AND FOX

MANAGEMENT OVERVIEW

The humane raising of mink or fox under farm conditions requires a thorough knowledge of the animals' life functions and a sincere sensitivity for their welfare. The mink or fox farmer must have sufficient competence and financial resources to supply adequate facilities and care to accommodate the animals' needs, including proper housing, nutrition, and health care, with a minimum of stress to the animals.

These Generally Accepted Agricultural and Management Practices (Practices) for the care of farm-raised mink and fox were compiled primarily from the **Standard Guidelines for Operation of Mink Farms in the United States** and the **Standard Guidelines for the Operation of Fox Farms in the United States**. These standard Practices were developed by the **Fur Commission U.S.A.** and adopted by the mink and fox farming industries to promote sound husbandry and humane treatment of these animals in accordance with current accepted moral and ethical standards.

MANAGEMENT PRACTICES (INCLUDING TRANSPORTATION)

Nutrition: Mink and fox should be fed a complete and wholesome dry food or a conventional "wet" diet. The diet should meet the nutrient requirements of the animals. Feed should be provided to the animals in suitable containers that will allow them easy access to a clean, fresh diet. Each pen should be supplied with a fresh, clean source of drinking water that is available to the animals ad libitum. Ready access to potable water is particularly important to animals fed dry diets and during extremely warm weather and periods of freezing temperatures.

Handling and Transportation: Precautions must be taken when handling mink and fox to prevent injury to the animals and the handler. Mink are routinely handled with heavy leather gloves, while fox are most commonly handled with metal tongs.

Transportation of mink and fox requires special attention to size and strength of traveling crates and care of the animals in transit. Detailed recommendations for transportation of mink and fox have been published by the Fur Commission U.S.A.

RECOMMENDATIONS FOR ENVIRONMENT

Mink and fox farmers should establish effective hygiene and sanitation programs. These programs should include effective vermin (insects, ectoparasites, and avian and mammalian pests) control, removal of manure from under pens, routine inspection and cleaning of cages, nest boxes, and feeding and watering equipment.

FACILITIES AND EQUIPMENT

Site: Mink and fox farms should be located in appropriate areas with consideration for local environmental conditions, excessive noise or disturbances, good drainage, effluent disposal, and future expansion. It is desirable to establish a buffer zone separating the yard where mink or fox are housed from the surrounding neighborhood. A protective fence around the perimeter of the yard is also desirable.

Sheds: Mink and fox should be afforded protection from the elements. Typically, they are housed in pens in open-sided sheds. However, they may be housed in outdoor cages with attached nest boxes. Where extreme weather conditions (blowing snow, driving rain, high winds, etc.) prevail, additional protection for the animals should be considered.

Pens: Mink and fox are typically reared singly or in pairs or as littermates (foxes) from weaning through pelting. It is recommended that breeder mink be housed singly while breeder fox may be housed singly or in breeding pairs.

Mink and fox pens should be of sufficient size to promote the general welfare of the animals and allow them to perform normal physiological functions, including rest, sleep, grooming, defecation, breeding, whelping, and raising young. Recommended pen sizes for mink and fox are given by the Fur Commission U.S.A. and the Canadian Federation of Humane Societies. The pens should be constructed of durable non-toxic corrosion resistant materials to securely hold the animals and promote good sanitation. It is desirable to have the pens suspended above the ground to allow feces and urine to fall from the pens and for cleaning the manure from under the pens.

Each pen should be provided with a clean, dry nest box or "nester" of adequate size where the mink or fox can rest or sleep comfortably. During cold weather and the reproductive and early kit (pup) growth periods, nest boxes should be provided with a suitable bedding material, such as marsh hay, straw, wood shavings, excelsior, or crushed sugarcane. Pens and nest boxes for breeding females should allow sufficient space for the dam to whelp and rear the litter to weaning.

Equipment: All feed preparation equipment, such as grinders, mixers, feed containers, etc., should be cleaned thoroughly after each use and maintained regularly.

Dry diets and dry feed ingredients should be stored off the floor under dry conditions and protected from vermin. Freezing and/or refrigeration facilities are required if fresh or frozen animal by-products or prepared conventional diets are stored.

HEALTH CARE AND MEDICAL PROCEDURES

A program of disease prevention and control should be established. Mink and fox farmers should be aware of the well being of their animals and should develop the ability to detect signs of illness, such as lethargy, abnormal behavior, change in appetite, abnormal feces, etc. All mink and fox should be observed at least once a day. Any sick or injured animals should be immediately treated or if necessary humanely euthanized.

Mink should be vaccinated against botulism, distemper, virus enteritis, and pseudomonas pneumonia and screened periodically for Aleutian disease. Fox should be immunized against encephalitis and distemper and periodically treated to prevent or eliminate internal and external parasites. In the event of a disease outbreak, the farmer should contact a veterinarian immediately, quarantine the affected animals if the disease is infectious, and implement a program to eliminate the disease.

Euthanasia: It is important that mink and fox farmers utilize humane techniques for euthanasia of their animals. The animals should be dispatched as quickly and painlessly as possible. The Fur Commission U.S.A. recommends acceptable procedures for euthanasia of mink and for fox. Other acceptable procedures for euthanizing mink and fox including these identified in the report of the AVMA Panel on Euthanasia.

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GENERALLY ACCEPTED AGRICULTURAL AND MANAGEMENT PRACTICES FOR FISH

MANAGEMENT OVERVIEW

Michigan fish growers are composed mainly of small firms concentrating on trout production which includes a mixture of dressed fish, fee-fishing, and planting stock sales. People involved in commercial game fish production or fee-fishing operations are required to obtain an aquaculture registration from the Michigan Department of Agriculture. People involved in production of fishes for stocking public waters shall also obtain a permit from the Michigan Department of Natural Resources. Five firms produce over 50% of the approximately 1.65 million pounds (750,000 kg) of fish produced annually with a market value of approximately 2.5 million dollars. In addition to the Michigan game fish breeders, there are bait fish operators and a carp farm. Because of the diversity of fish species raised for commercial sale and the variety of husbandry systems used, recommendations for fish care must be general in nature. These Generally Accepted Agricultural and Management Practices apply only to fishes and do not apply to other aquaculture products.

MANAGEMENT PRACTICES

Stock Procurement: An established list of approved species for aquaculture production is contained in the Michigan Aquaculture Development Act (Act No. 199, Public Acts 1996, 286.875, Section 5(2)). Only aquaculture species on the approved list are allowed for purposes of aquaculture production.

Fish should be obtained from a source with a history of freedom from disease. Salmonids of all life stages obtained from an out-of-state hatchery must be certified as being free of certain diseases.

Newly acquired fish should be checked to determine that they are in good condition, regardless of the availability of health history information. Healthy fish should show good coloration and be well finned, with no obvious abrasions or lesions. Opercula should completely cover the gills and not stand out from the head. The fish should appear alert and actively interested in feed, with no tendency to gather at the inlets or outlets to the tanks or ponds. There should be no evidence of dead fish at the sides or on the bottom of the transport tanks. Uniform size is indicative of good management and may be important to avoid cannibalism.

It is illegal to import and stock grass carp or white amur (Ctenopharyngodon idellum), Japanese weatherfish (Misgurnus anguillicadatus), ide (Leuciscus idus), rudd (Scardinius erythrophthalmus), bitterling (Rhodeus sericeus), and tench (Tinca tinca) into Michigan without permission from the Director of the MDNR.

Transportation: Healthy fish may be safely and easily transported as long as care is taken to reduce the associated stress. Feed should be withheld from farm-reared fishes for two days prior to transport to reduce fouling of the transport water. Since the stress of transport often results in fish going off feed, feed should be withheld for one or two days after receipt, followed by a gradual return to normal feeding levels.

To minimize stress, the temperature of transport water should not vary greatly from the supplier's ambient water temperature. However, fish will generally travel better in cold water because of lowered oxygen requirements and higher levels of available dissolved oxygen. Transport containers should be insulated to minimize water temperature changes during transport, especially if transport is over a long distance, time, or involves extremes of weather. Although mild anesthesia may be employed during transport, this is usually unnecessary.

Large, covered transport containers should be filled to the top with water, in order to reduce slopping and consequent damage to the fish. However, the reduction in water surface area exposed to the air will reduce oxygen uptake. It may be desirable to provide a supplemental aeration source when transporting over long distances or during hot weather to bubble oxygen or compressed air through the water or to recirculate it by means of pumps or agitators.

Small numbers of fish can be safely transported over long distances by a method recommended by the International Air Transport Association (IATA): "Plastic (polyethylene) bags should be filled about 1/3 with water, the remaining air being expelled and replaced with oxygen. The top of the bag should be firmly tied by twisting and bending over on itself. The bag should preferably be placed inside another similar one and then placed in an insulated container of expanded polystyrene covering the top, bottom, and all four sides. This insulated container should then be placed in a strong fiberboard outer container. Fish packed in this manner may be shipped for period of 48 hours without inducing significant stress and subsequent diseases."

It is difficult to generalize on the number or weight of fish that may be safely transported in a given volume of water. Safe transport densities vary according to species, age, water temperature, oxygenation, and the distance and length of time over which the fish are to be transported. Generally, 2.2 pounds of fish per 2.6 gallons of water can be transported for a period of approximately eight hours with oxygenation at cool water temperatures.

The same general principles apply to transporting eggs; however, eggs may be extremely susceptible to damage at certain stages in their incubation. Salmonid eggs may be transported for a period of approximately two days immediately after fertilization and water hardening (1-2 hours), or after they have become "eyed" (eyes of the embryo visible through the shell). Between these periods, eggs should not be transported or handled.

Handling: Fish handling should be minimized to reduce stress and damage to the skin leading to bacterial and fungal disease. Nets and other materials for handling fish should generally be soft to reduce skin damage and should be sanitized before and after use to reduce disease transfer.

Nutrition: Active feeding is often a good indicator of the health status of fish. Sick fish often quit eating before other disease signs become noticeable. Commercially prepared pellets are available for a variety of fishes which are often acceptable to other fish species. Live feeds may be required for rearing some species of fishes; however, live feeds may not meet the nutritional needs of the fish unless multiple species of feed items are used.

Optimum feeding rates vary depending on species, size, feed composition, water temperature, and desired growth response (maintenance vs. maximum growth rate). Feeding tables have been developed for salmonids which can be used for general care recommendations. Feeding once or twice a day for the five working days is usually adequate; however, fry require more frequent feedings which should extend throughout the entire week. Feeding by hand may be preferable to use of automatic feeders since it encourages frequent inspection of the fish and early detection of problems.

RECOMMENDATIONS FOR THE ENVIRONMENT

An ample and dependable supply of high quality water is an indispensable qualification for keeping fish. Fishes are in constant, intimate contact with their aquatic environment and even minor changes in water quality may cause stress that predispose them to disease. Chemical, physical and biological factors in the water environment will affect different fish species in different ways.

Water temperature is probably the single most important environmental factor. Fish are, with a very few exceptions, unable to physiologically control their body temperature. Most body functions, such as rate of growth, appetite, respiration and heart rate, are temperature-dependent. Each fish species has a preferred temperature that is affected by its acclimation temperature. In general, the preferred temperature range for coldwater fishes is 46-60°F, for coolwater fishes is 60-68°F, for warm water fishes is 64-72°F, and for tropical fishes is 73-86°F. Temperatures outside these ranges may, however, prove perfectly acceptable, depending on the species and other variables involved. Although most fish can be gradually acclimated to tolerate temperature extremes, temperature that promotes growth and reproduction should be considered the optimum temperature for holding fishes.

The acclimation of fish to a new temperature, either when introducing new fish to a facility or when adjusting temperatures within a facility, should proceed as gradually as possible. Change should probably not be greater than one degree fahrenheit per hour and

should be even more gradual at the extremes. Carefully observe fish for two weeks after transport and/or handling for signs of stress induced bacterial diseases. When adjusting water temperatures, all other stresses (e.g. handling) should be minimized.

Oxygen (O_2): Oxygen is another important factor in fish farming. Oxygen concentrations are closely related to temperature. As the temperature of water rises, its holding capacity for O_2 decreases. At the same time however, the O_2 requirements of the fish increases because of an increased metabolic rate. At temperatures in the preferred range, decreasing availability with increasing demand usually causes no problem as there is still enough O_2 available. When waters are above preferred temperature ranges, polluted or heavily overstocked, there may be insufficient O_2 available. Respiratory stress syndrome may occur if energy expenditures in obtaining the limited O_2 available exceed the potential energy gain. Respiratory stress syndrome will result in death.

Variables other than temperature, that under normal circumstances affect O_2 requirements, include: Species - active fishes require more O_2 than slower moving fishes; size - small fish require relatively more O_2 per unit of body mass than large fishes; and plan of nutrition - fish require additional O_2 for metabolism of feeds. As a general guide, 5-6 ppm and 2-3 ppm are considered to be an absolute minimum O_2 requirements for cold and warmwater fishes, respectively. More desirable O_2 levels for coldwater and warmwater fishes would be 8 ppm and 5 ppm, respectively.

Spring, well, and surface water can be acceptable sources of water for fish farms in Michigan. Spring and well water is generally an excellent water source for fish farm use. The ground acts as a filter to remove microbial flora and parasites. Ground water temperatures at most locations will remain relatively constant, often varying by little more than 2 throughout the year. However, water temperatures will vary considerably across the state. Levels of dissolved oxygen can be low, however, well waters may be supersaturated with nitrogen or carbon dioxide. Use of packed columns or pure oxygen systems may be essential in order to saturate the water with oxygen and to drive off the supersaturated gases.

Surface waters may be acceptable, if known to be clean, but will require careful monitoring. Problems often associated with this water source include: Diurnal temperature variation, and temperature extremes throughout the year; possible pollution; and introduction of wild fish populations. Although the presence of wild fish may be a good bio-indicator of the suitability of the surface water, it represents a constant potential hazard as a reservoir of infectious diseases.

FACILITIES AND EQUIPMENT

Facilities and equipment needed for fish farming are primarily dictated by the species and life stage of fish being raised and the type of operation. Fish can be raised in tanks, ponds, or raceways. The design and suitability of these systems depend on water availability and quality. Expert input needs to be sought and incorporated in the designs of systems to meet specific needs of the fish and production system.

HEALTH CARE AND MEDICAL PROCEDURES

Stressors, such as changes in water quality or handling, may predispose fish to disease. Fish diseases can be treated and controlled, however, success in the handling of health problems requires that expert advice be sought. The earliest signs of fish disease are usually changes in behavior. For example, fish may aggregate at the inflow if O₂ levels are too low. Conversely, they may accumulate at the outflow of the tank, if a toxic substance is present in the inflow. Sick fish usually lose their appetite. Certain conditions may cause fish to whirl or spiral in the water or, in the case of some external parasites, show their irritation by "flicking" themselves off the sides or bottom of the tank. Individuals that become sickly usually separate from the group and will frequently be found at the sides of tanks; and they will also prove less active in their response to stimuli.

Various changes in appearance also signal disease problems. Sick fish often change color. For example, fishes may become darker or lighter if infected with bacteremias. Diseases that specifically affect the gills often elicit an excessive production of mucus which may be seen streaming out from the opercula. Skin diseases may also cause an excessive mucus layer to accumulate which may become visible as a gray sheet on the skin surface. In the case of some fungal infections, a gray cotton-wool-like mat can be seen on the affected area. Fungi are frequent secondary invaders on a virtually any skin or fin lesion, regardless of its primary cause.

Very often parasites and microorganisms that have the potential to cause disease may be isolated from diseased fish, but are later found to be incidental and unrelated to the actual cause of the disease. At other times, it may be possible to identify or isolate a disease causing agent from an obviously sick fish. Under these circumstances, a full evaluation of all the information available from hematology, histopathology, biochemistry and microbiology, will be required if an accurate diagnosis is to be achieved. However, an accurate diagnosis is essential for appropriate treatment and control. An experienced diagnostic fish pathologist should be consulted when a disease problem arises.

The treatment of external parasitic, fungal, or bacterial disease includes the use of baths, flushes and dips with chemicals specifically approved for fish use. Treatment of some systemic diseases may require therapeutic agents administered in the feed to those fish still feeding. Such agents may act both externally and internally, being absorbed from the water.

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GENERALLY ACCEPTED AGRICULTURAL AND MANAGEMENT PRACTICES FOR BROILERS, TURKEYS, AND GAMEBIRDS

MANAGEMENT OVERVIEW

There are approximately 4.5 million commercial turkeys and less than one-half million commercial gamebirds in the state of Michigan. There are no commercial broiler chickens produced in Michigan. Commercial housing varies considerably from location to location. In addition, there are several thousand hobby and backyard flocks which utilize a wide variety of free range and/or confinement shelters and housing.

These Generally Accepted Agricultural and Management Practices (Practices) are intended to assist the broiler, turkey, and gamebird producer in attaining and maintaining a high quality of bird comfort and well-being in broiler, turkey, and gamebird production facilities and will focus on the birds' basic requirements.

MANAGEMENT PRACTICES (INCLUDING TRANSPORTATION)

Nutrition: Feed and clean water should be available to the birds at all times and when new birds are placed in the system, care must be taken to ensure that the birds find the feed and water sources. In situations where high environmental temperatures can be encountered, additional water space per bird is recommended.

Beak trimming and specs: Due to the temperament of chickens, turkeys, and gamebirds toward feather picking, fighting and cannibalism, the beaks of birds can be trimmed to remove their sharp tips as an aid in prevention of these actions. Trimming should be done by properly trained workers and should be done at the prescribed times, generally at the hatchery. In addition, specs or blinders, may be attached to the beak of the bird so that the birds can see to the right or left, but not straight ahead. This should be done by properly trained workers and should be done when the birds are of sufficient age to readily find the feed, water and other visual environmental necessities.

Toe trimming: Due to the tendency of turkeys to inflict bodily damage upon each other with their toenails in confinement situations, one or more toenails (generally the inside and middle toes on both feet) may be removed. Toe trimming (or declawing) should be done by properly trained workers and is generally done at the hatchery.

Transportation: Safety and comfort of the animals are of prime importance when transporting live poultry and gamebirds. When poultry and gamebirds are transported, they should be provided with proper ventilation for the conditions, and clean sanitized vehicles and equipment.

Chick and poultry delivery: The day-old chick and poultry delivery vehicle should have the capability of maintaining a uniform temperature of 75°F (24°C) to 80°F (27°C) regardless of ambient temperature. Air circulation must be maintained around all chick-poultry boxes at all times regardless of their location in the vehicle. The vehicle should not stop from the time it is loaded until it reaches its destination. Provisions for maintenance of proper ventilation and temperature control should be provided in case of vehicle's mechanical failure or any other unforeseen vehicle stop(s). The transportation vehicle should be properly cleaned and sanitized between deliveries.

Adult poultry and gamebird delivery: When adult poultry and gamebirds are transported, adequate ventilation, space and flooring should be provided. Hot weather is a time for particular caution. The birds should be protected from heat stress by being shaded and/or moved during the dark hours. Prompt unloading and/or auxiliary ventilation is essential when the birds reach their destination. During transportation in cold weather, birds should be protected by use of windbreaks, partial covering, etc. Ventilation must always be adequate.

Range rearing: The growing of chickens, turkeys, and gamebirds in range pens, after the brooding period, is an accepted practice and may be the system of choice, especially for several species of gamebirds. Range reared birds should have adequate space (see references) as well as protection from extremes in climatic conditions, predators and disease inherent with this growing system.

RECOMMENDATIONS FOR ENVIRONMENT

Ventilation and lighting: Ventilation in the grower house shall be such that a healthy, acceptable level of moisture, gases, dust and temperature is maintained without drafts or dead air pockets. The ventilation system should be adjusted daily, or more often, as the environmental conditions dictate.

Lighting should be provided to allow effective inspection of all the birds and sufficient light for the birds to eat and drink. Light intensity within the house should be a minimum of 0.4 foot candles.

The housing should provide shelter from disturbing noises, strong vibrations, or unusual stimuli, regardless of origin.

FACILITIES AND EQUIPMENT

Housing: The design, construction and management of a poultry housing system should meet the birds' need for shelter against undesirable environmental conditions such as extreme cold, excessive heat, rain and wind and modify these climatic conditions to conform to an adequate environment for broilers, turkeys, and gamebirds. They shall be constructed to minimize transmission of disease, parasites and other vermin infestation and optimize the principles of disease prevention. The housing should also protect the birds from all forms of predators and allow for daily visual inspection and care.

Broilers: Brooding and growing space requirements and water and feeder space should conform to the general needs as outlined in the particular broiler company's management guide, e.g. Cobb's Broiler Manual (1984).

Turkeys: Brooding and growing space allowances and feeder and water space for turkeys should conform to the general needs as outlined by Berg and Halvorson (1985).

Gamebirds: Brooding and growing space allowances and feeder and water space for gamebirds should conform to the general needs as outlined by Flegel and Sheppard (1981) and Eleazer, et. al. (1990).

Litter: Many different types of litter can be used. All litter must be dry and of acceptable quality. It is acceptable to reuse litter for several successive flocks as long as ammonia and insects are controlled and there has been no disease outbreak.

HEALTH CARE AND MEDICAL PROCEDURES

Optimal management practices are essential to maintain good health status in the production facilities and may be in consultation with a veterinarian. A program of disease prevention and control should be established. Only federally approved medications and vaccines shall be used, following label directions in accordance with state and federal regulations.

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